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ABSTRACT

A study was undertaken to determine how children of different ages used drawing to present an atypical situation, to what extent children's responses were governed by their increasing cognitive competence, and to what extent children's responses reflected an increasingly articulate grasp of the medium itself. A total of 137 children in kindergarten through sixth grade were asked to make pairs of drawings of an unwrecked and a wrecked car. Each child's drawings were compared to identify the kinds of graphic devices used to mark the condition of the car. Proceeding from J. S. Bruner, R. R. Olver, and P. Greenfield's distinction between enactive, ikonic, and symbolic modes of thought, two kinds of line quality were identified: gestural line (highly enactive) and distorted line (iknoic/symbolic). On this task, the use of enactive line decreased as a function of age and the use of ikonic/symbolic line increased with age. Younger children reverted to the enactive mode, relying heavily on the manner in which the image was made to mark the condition of the car. Older children understood that the image itself--the residue of drawing activity--and not just the activity itself, must be changed if the image is to convey information to the viewer. (Author/FL)

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Longfellow Hall
Graduate School of Education
Harvard University
Cambridge, Mass.

Co-Directors:

Howard Gardner and David Perkins

Technical Report No. 10

THE ORTHOGRAPHY OF DISASTER:

CHILDREN'S DRAWINGS OF WRECKED CARS

by

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The Orthography of Disaster: Children's Drawings of Wrecked Cars[1]

Interest in children's art has, in the past few years, focused largely on the ways in which children's drawing inform us about the mental capacities of the child. From an examination of drawings, researchers infer certain kinds of mental processes, both cognitive (see Piaget, 1973, and Harris, 1963) and affective (see Alschuler and Hattwick, 1947). Until recently, little or no attention was paid to the properties of the medium in which the child was working. Students of children's work, such as Arnheim (1971), Golomb (1969), Freeman (1972), and others have helped to focus attention on the interaction between the kind of thinking which goes on and the characteristics of the medium which constrain the expression of such thought.

The purpose of this study was to examine the question, How do children use the drawing medium in order to present an atypical situation? That is, what features of the drawing medium do children manipulate in order to change the meaning and impact of their imagery? To what extent are children's responses governed by their increasing cognitive competence--as Piaget's (1973) model might lead us to expect? And, to what an

extent do children's responses reflect an increasingly articulate grasp of the medium itself--as Bruner (1966), and Olson's (1970) work might suggest? Thus, in order to examine the ways in which children invent new graphic forms or transform old ones, children in this study (See Pariser, 1976 for further details) were asked to make pairs of drawings of a car: one showing the car before an accident, and one showing the same car after an accident. By securing matched pairs of drawings of the same object, one would be able to isolate the graphic devices used to mark the condition of the object without the confounding caused by vagaries of individual style.

The topic of cars was chosen because of its popularity and familiarity. That cars are readily drawn, and are of interest to most children in this culture, has been documented by Hurlock and Thompson (1934), Lark-Horovitz et al. (1967), Loney (1971), and others. There were several reasons for asking for "wrecked" as well as "unwrecked" cars. First, when cars are damaged, they do not assume standard shapes. Thus the children were given a task for which there were no obvious solutions. The children were required to invent forms and graphic techniques suitable to the task. Second, precisely because there are few graphic conventions for wrecked cars (as opposed to "smiley faces" or "snoopies"),

it was hoped that the task would reveal developmental changes in children's spontaneous use of the medium.

The work of Bruner et al. (1966) suggested a basis for comparing the drawings of older and younger children. Bruner makes the distinction between enactive, ikonic and symbolic modes of thought. Enactive thought is characterized by action which does not separate the activity from the thing acted upon. Thus, for example, "ladders" and "climbing up" are conceived of as one and the same. Thinking based upon ikonic representation is capable of distinguishing between object and activity. It is, however, limited to the manipulation of visible or "picturable" elements. Symbolic representation is the final step in the development of internalized representation and utilizes culturally given systems of symbolization, i.e., language, number, etc. Bruner hypothesized that as children develop competence in a medium they move from one level of symbolization to another. A model quite similar to Bruner's has been developed by Smith (1972) and applied to the development of children's painting skill. It was decided to use the enactive/ikonic distinction as a way of organizing the children's graphic responses to this drawing task.

Two kinds of line quality in the drawings were identified; gestural--or highly enactive line, and

distorted or ikonic line. Gestural line embodies many features which suggest its enactive nature; it occurs early in graphic development (Biber, 1960; Kellogg, 1969). (According to Arnheim, 1971, gestural line may arise from expressive gesture.) According to Smith (1972) such lines exist as ". . . a fusion of making a mark and the movement of the object symbolized" (Smith, 1972, p. 14). Distorted line is a kind of line whose form is much more clearly dictated by visual and symbolic considerations than gesture. It is controlled, and fairly regular. It occurs conventionally in the work of children to suggest activity or emotional impact, according to Lark-Horovitz (1967). Unlike gestural line. distorted line can be integrated fully into the outline of an object--thereby both delineating the object--setting it off from its ground--and suggesting something about the condition of the object.

Method

Subjects

137 children between the ages of four and eleven, from predominantly middle-and-upper-middle-class public schools, were asked for pairs of drawings. There were 20 kindergarten children, 31 second-graders, 20 third-graders, 25 fourth-graders, 20 fifth-graders, and 21 sixth-grade children.

Materials

Drawing implements were pencils or ball point pens. Manilla or newsprint cut into 9" x 11" sheets were used. Occasionally, children used crayons or magic markers to add color.

Procedure

Pairs of drawings were elicited with the following instructions. The experimenter would say, "I want you to make two drawings for me. The first one should be of a car in perfect condition--just like one you'd really want to have. The second drawing should be of that same car, after it has gotten all wrecked up." There was no time limit for making the drawings. All children were given the materials following the instructions. Children in kindergarten through third grade generally took between ten and fifteen minutes for a pair of drawings. Children in the upper grades took longer--up to half an hour--for a pair of drawings. Regardless of how long children took, the bulk of class time was set aside for the drawing task, so that the children had a sense that there was time available for careful work.

Scoring and Definitions

Drawings of wrecked and unwrecked cars were scored for the presence of two line qualities, gestural line and distorted line. Gestural line was defined as any line with a predominantly motoric component. Gestural line can be used in several ways; it can be substituted for the object symbolized; it can overlay the object, and it can be used to mar or surround the object without obscuring it. Any and all instances of this kind were scored as "use of gestural line." (See Figure 1.) Distorted line was defined as controlled, jagged line, where the amplitude of the peaks and troughs is roughly the same. The line does not have to be clearly angular, but it should be regular in terms of its periodicity. Distorted line can be added to, or integrated into body outline. The placement of such line in relation to body outline can be used to suggest varying referents. (See Figure 2.)

Integration of distorted line into body outline can occur ubiquitously throughout the object contour, or it can be restricted to only certain portions of the outline. What should be noted is that when distorted line is integrated into the total outline, the underlying structure of the object may remain the same; i.e., it will still consist of the same number of strokes, with the same internal relationships between these several lines.

Drawings were scored for the presence of these line qualities, as defined above. Inter-scorer agreement for these two feature was acceptable: Three judges were given a sample of chilren's drawings and agreement among the scorers ranged between 80% and 85%.

Findings

Gestural and Distorted Line

General trends in the use of gestural line followed a pattern shown in Figure 3. The percentage of children using gestural line in car wreck drawings, decreased steadily as a function of age ($p < .05$). The use of distorted line increases as a function of age. This trend is illustrated in Figure 4. When drawings from older and younger children were compared, it was found that a significantly greater percentage of children over ten years old integrated distorted line ($p < .005$).

There were two clear findings. One was that neither older nor younger children used either gestural or distorted line in their drawings of unwrecked cars. The second was that the use of both kinds of line quality in car wreck drawings varied as a function of age. Yet another factor distinguished the older and the younger children's use of the medium. Although these findings did not reach statistical significance, it did appear that young children were more prone to add distorted line

than to integrate it into their drawings whereas most of the older children (10 years and over) tended to integrate the line quality into the outline. Drawings by Terence (Figure 5) and Peter (Figure 6) suggest a possible developmental progression; Terence drew the undamaged front end of his car first, then added the zig-zag line to suggest damage. Peter, presumably intending to show the same kind of damage, integrated the line into the drawing itself. His line does double duty as an outline--an indicator of "thingness"--and as an indicator of the condition of the thing.

Examples of Addition or Substitution of Gestural Line

It sometimes happened that when the kindergarten children were asked to draw a wrecked car, the resultant drawing lacked any referential features at all. Thus, Figure 7 shows how Fred, a kindergarten child, substituted gesture for the drawing of a wreck. Nothing is left to suggest a car save an enactive motor trace. Another solution to the drawing task, which also employs gestural line, is demonstrated in Michael's drawing (Figure 8), in which the lines obscure, but are not substituted for, the car itself. In this drawing, the referent is physically present on the paper, even though it is not visible.

Still other uses for enactive line are found in drawings by Molly (Figure 9) and Al (Figure 10). Molly adds gestural lines to the interior surfaces of her car, as a way of marring its appearance. She is using gestural line, not so much for its enactive, motoric properties, but for its visual properties; i.e., it can function as a blot or mark, on a uniform surface. Al (Figure 10) uses gestural line as well, but uses it more sparingly than Michael (Figure 8), whose gesture obscures the cars entirely. Thus, in developmental terms, at first the line quality is substituted for the focal object, then it is used to overlay, and finally it is used in juxtaposition to the focal object. Over time, gestural line is used less and less.

The use of distorted line seems to follow a similar course. Initially, the child obscures the outline as in Terence' drawing (Figure 5). Then line is integrated into outline, as in Peter's or Miguel's drawings. Here we see a movement from the addition of this line quality to its integration into outline.

In addition to the trend towards integrating line quality into outline, and to using gestural line less and less, another trend was noted: Older children tended to use contrastive line qualities within the same drawing, whereas younger children would differentiate the line

quality between the two pairs of drawings, but would not differentiate or contrast line quality within the same drawing. Thus, for example, Miguel (Figure 11) introduces distorted and controlled lines into his second drawing--reserving smooth lines for the lamp-post above the point of impact. Miguel is playing off two different line qualities--and he is relying on the contrast to convey the idea that the car has been wrecked. In Mike's two drawings (Figure 12), we find the same intentional juxtaposition of smooth and distorted line, except that in this case the child uses his signature as a foil against which to contrast the line qualities used in the car. Mike is clearly thinking of these two qualities as a contrastive pair. It seems that Mike is dealing with his drawing as an integrated whole--a "Gestalt" within which all elements interact. He recognizes that the graphic quality of his signature affects the graphic quality of the car drawing.

Occasionally, even kindergarten or first graders show themselves capable of the same kind of linear juxtaposition. Patrick (Figure 13) shows two cars at the moment of impact. The integrated distortion of line serves several purposes. He distinguishes between the wrecked car on the right and the unwrecked car on the left. He also distinguishes between the broken, and

the unbroken leg of the driver in the right-hand car. The distorted line which Patrick uses serves two functions; it marks crumpled or wrecked auto bodies and broken legs--things which are not visually the same.

Discussion

In terms of line usage, the differences in response between the older and younger children, consist in the following; younger children tend to act on the images which they are trying to portray as wrecked. That is. they tend to almost physically obliterate or destroy the representation of a car. The prevalence of this kind of enactive strategy seems pervasive among the younger children, as we have seen from Figure 3. To this extent at least, it appears that one of the ways in which younger children handle the medium differently from older children, is that they do not respond to the drawing task as though it takes place in a two-dimensional medium. The children attempt to destroy the image of the car, in much the same way that they might try to destroy the car itself. They seem unaware, or unconcerned, that the significance of their gestural overlay will be totally lost on any observer.

This egocentric use of the medium among younger children has been documented by Korzenik (1972). The younger children have not grasped the a-temporal and

impersonal nature of the drawing medium. By contrast, older children who integrate or add distorted line and who use gestural line sparingly ensure that the viewer always knows what it is he is looking at, i.e., a car. These older children have aquired the notion that the process whereby an image is made, is not accessible to the viewer.

Such a realization is on a par with the understanding which some children also showed in a study by Bamberger (1977). Children were asked to invent a graphic notational system for keeping time with a piece of music. At first, children did not grasp the idea that unequal elapsed time between notes could not be represented by equal physical spaces between notations, even though the amount of time which the child spent with his pen poised above the page was very different from one note to the next. The children did not differentiate the temporal from the graphic dimensions of the task. In the same way, the younger children in this study could not distinguish between the excitement and energy of the lines they used in obliterating the cars, and the car themselves. Older children were able to integrate both excitement, agitation or energy into a recognizable drawing of a car.

Thus, the youngest children understood the drawing medium--the piece of paper as a "field of action" within which the subject matter of the drawing could be enacted. Older children began to show some understanding that it is the image itself--the residue of the drawing activity which carries meaning for the viewer. Thus line qualities come to be added to the focal image, or integrated into it.

To return to the initial question: In what ways do younger and older children differ in their use of the drawing medium? When showing something atypical such as a wrecked car, younger children tended to use an atypical method of drawing. They in fact reverted to a more primitive form of symbolization--the enactive mode--in Bruner's terms. The older children also use more primitive kinds of line quality--but they do so with a better sense of what the medium will permit: hence the use of distorted line, a kind of line quality which can be integrated into the drawing in such a way that the formal properties of the drawing are preserved.

Comments made by some children in a later study suggest that for these children, the task of showing a wrecked car was synonymous with making a regressed or technically deficient image. Linda (Figure 14), for example, evinced a good deal of anxiety about being able to make an adequate drawing. The experimenter tried

to clarify for her the difference between an awful drawing of a car, and an accomplished drawing of a car in bad condition:

Linda: What if it turns out awful?

Experimenter: If it turns out awful, it turns out awful. There's nothing to worry about.

Linda: Well, it's supposed to turn out awful. . . .

Experimenter: It kind of is . . . see, I don't want you to make an awful drawing--I want you to make a good drawing, but. . . .

Linda: Of an awful car?

Experimenter: Of an awful car, right.

A younger child, Hillary (Figure 15), revealed similar confusion about the task, by commenting as she added distorted line to her drawing: "This is how my brother would make a scribbly car." Hillary's brother was three, so evidently she identified her younger sibling's style as appropriate to the task.

We can therefore see that both from the children's own comments, and from the age-related use of line quality, the enactive use of line supplants a more advanced use, when atypical drawings are required. It should be noted in closing, that in many cases, the older and younger children envisioned the same kind of damage for their cars (numerous casual comments serve to corroborate this).

What differed was not the intellectual content of the drawings so much as the way in which the drawing medium was handled.

Footnotes

[1]Research for this paper was in part supported by the National Institute of Education (Grant # G-78-0031 to Harvard Project Zero).

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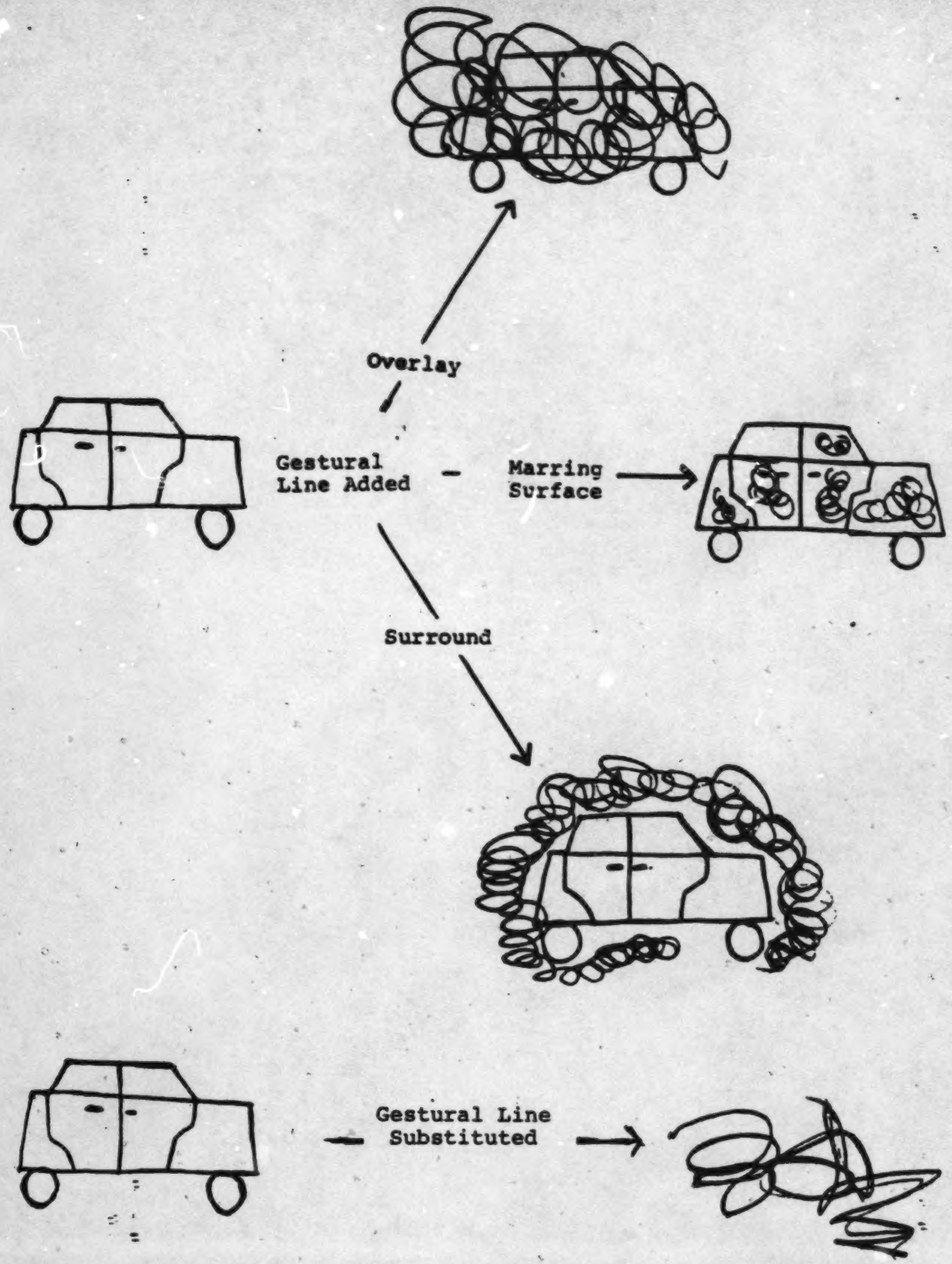
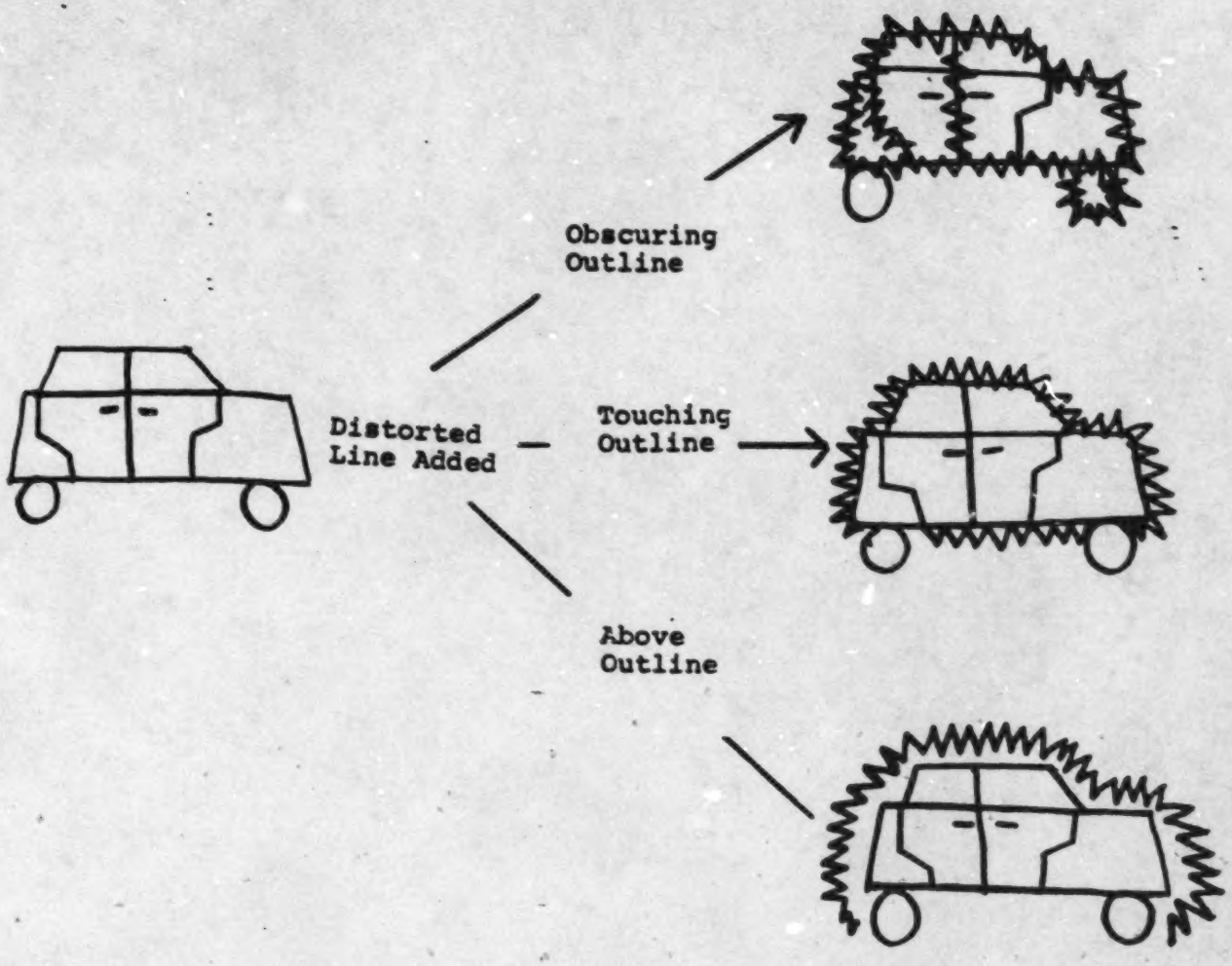


Figure 1: Showing examples of the use of gestural line.



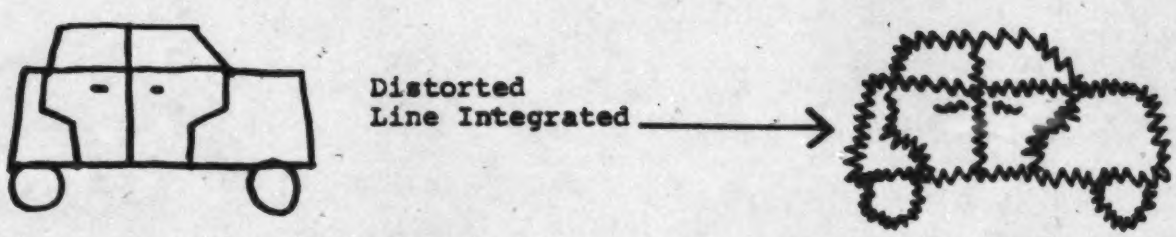


Figure 2: Showing examples of the use of distorted line.

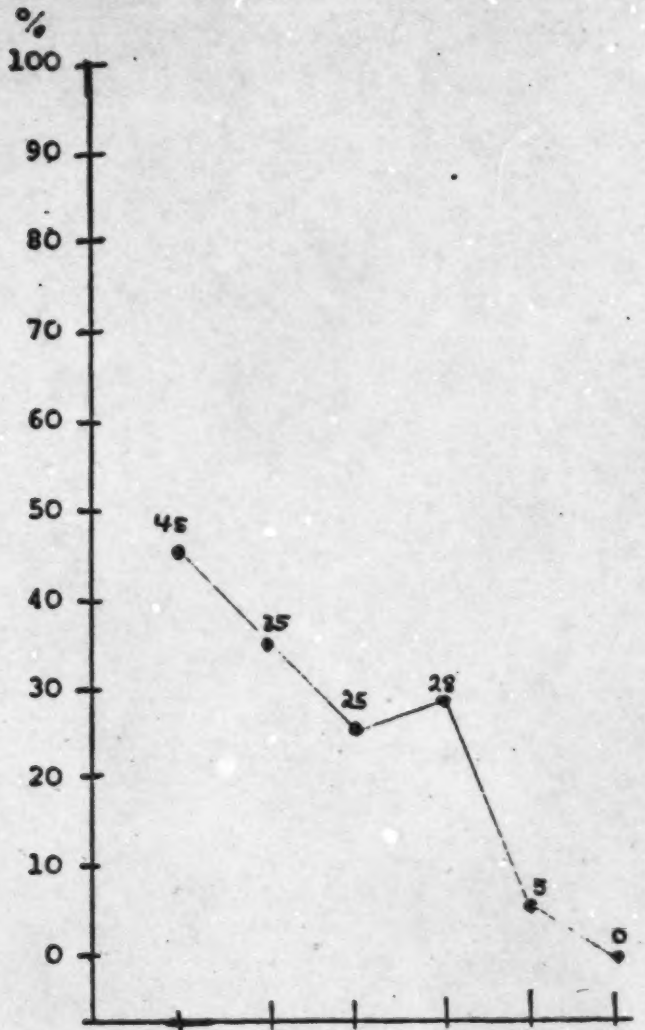


Figure 3: Showing the percentage of children who used gestural line in their drawings of car wrecks.

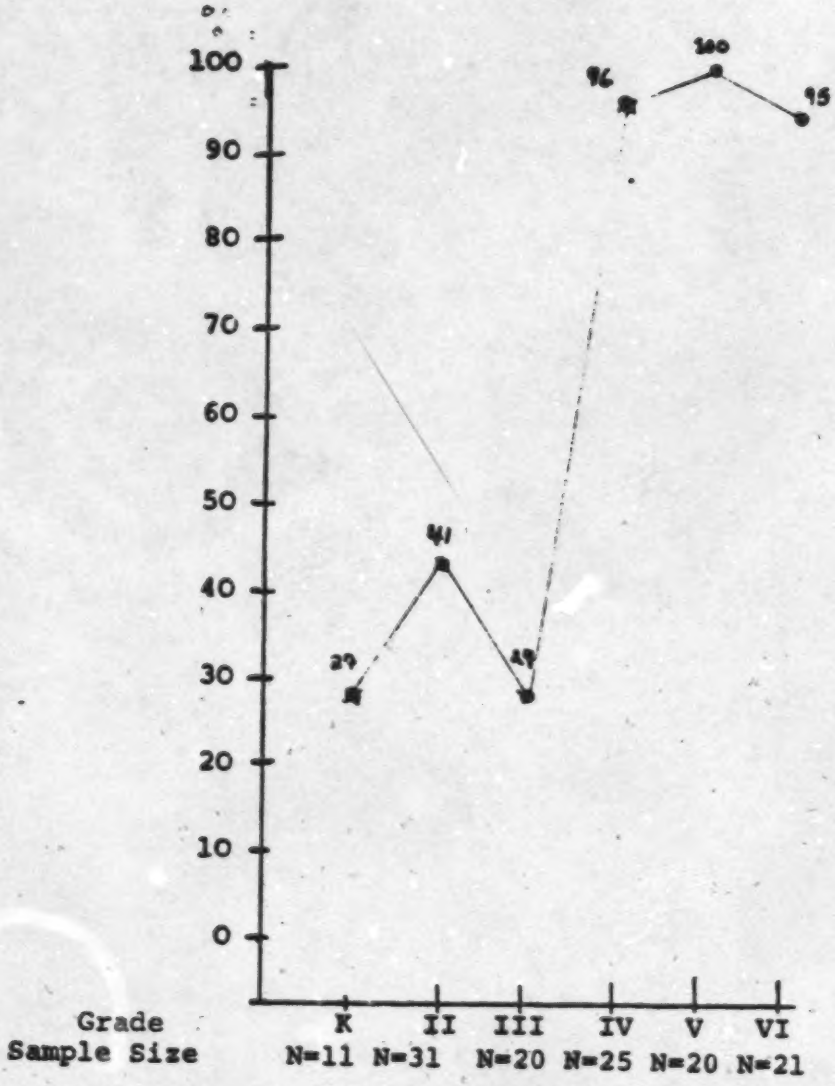
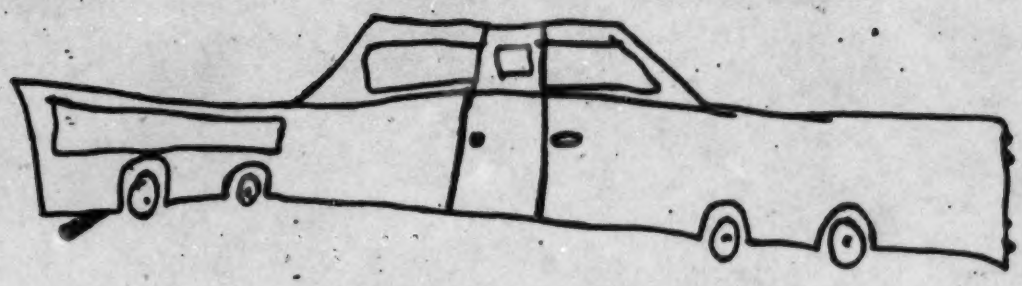


Figure 4: Showing the percentage of children who used distorted line in their drawings of car wrecks.

Unwrecked



Wrecked

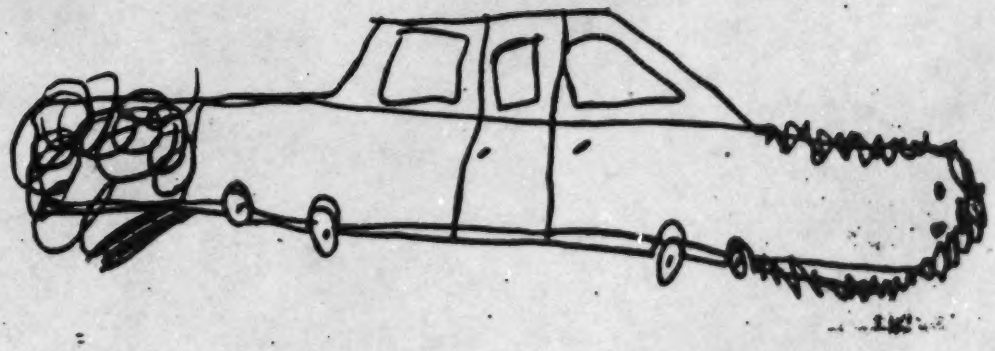
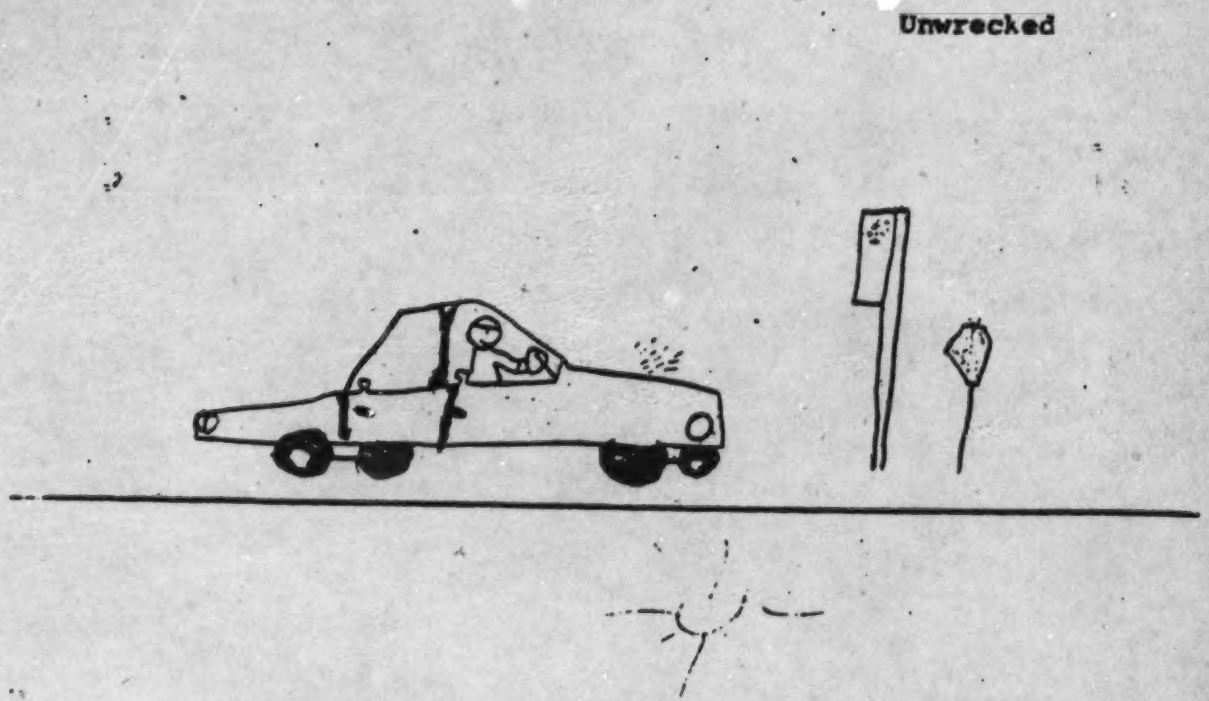


Figure 5: Drawings by Terence, age 8, showing: an unwrecked and a wrecked car.



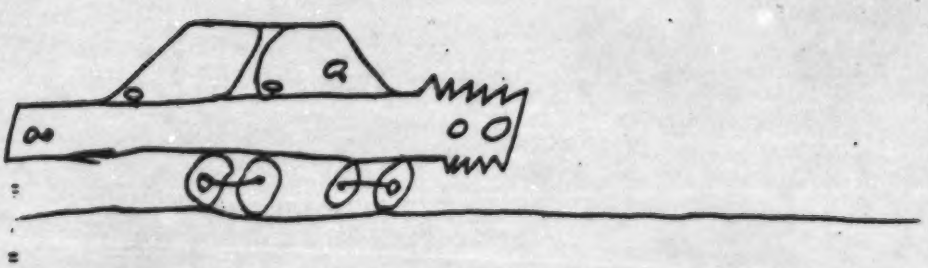
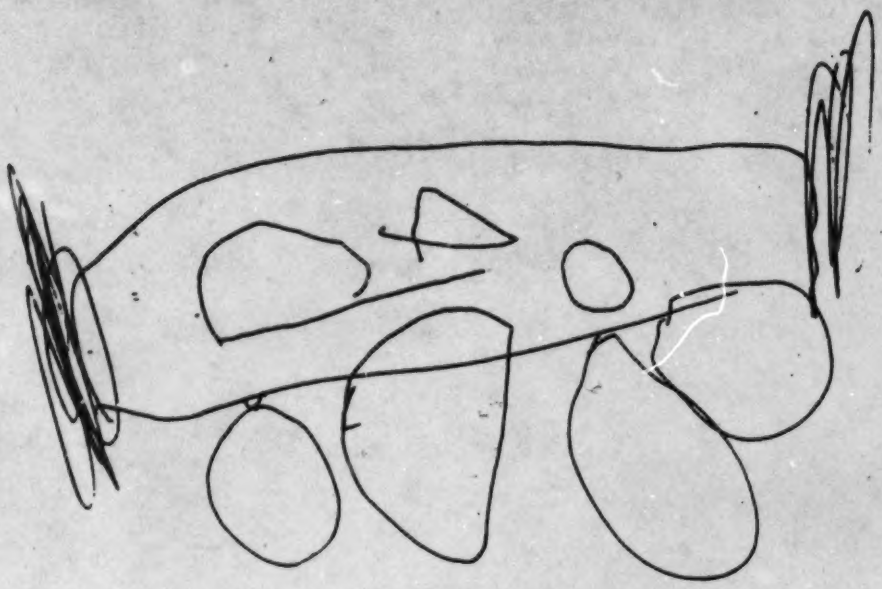
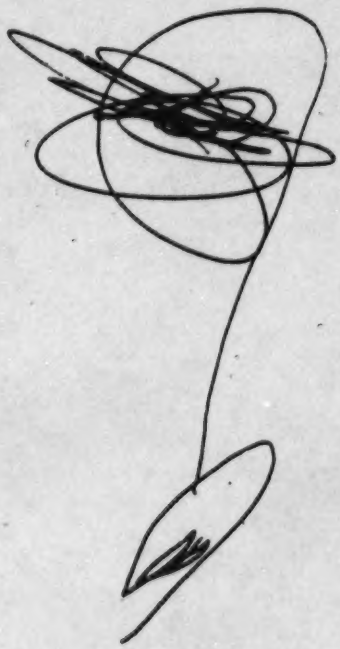


Figure 6: Drawings by Peter, age 8, showing: an unwrecked and a wrecked car.



Unwrecked



Wrecked

Figure 7: Drawings by Fred, age 5, showing: an unwrecked and a wrecked car.

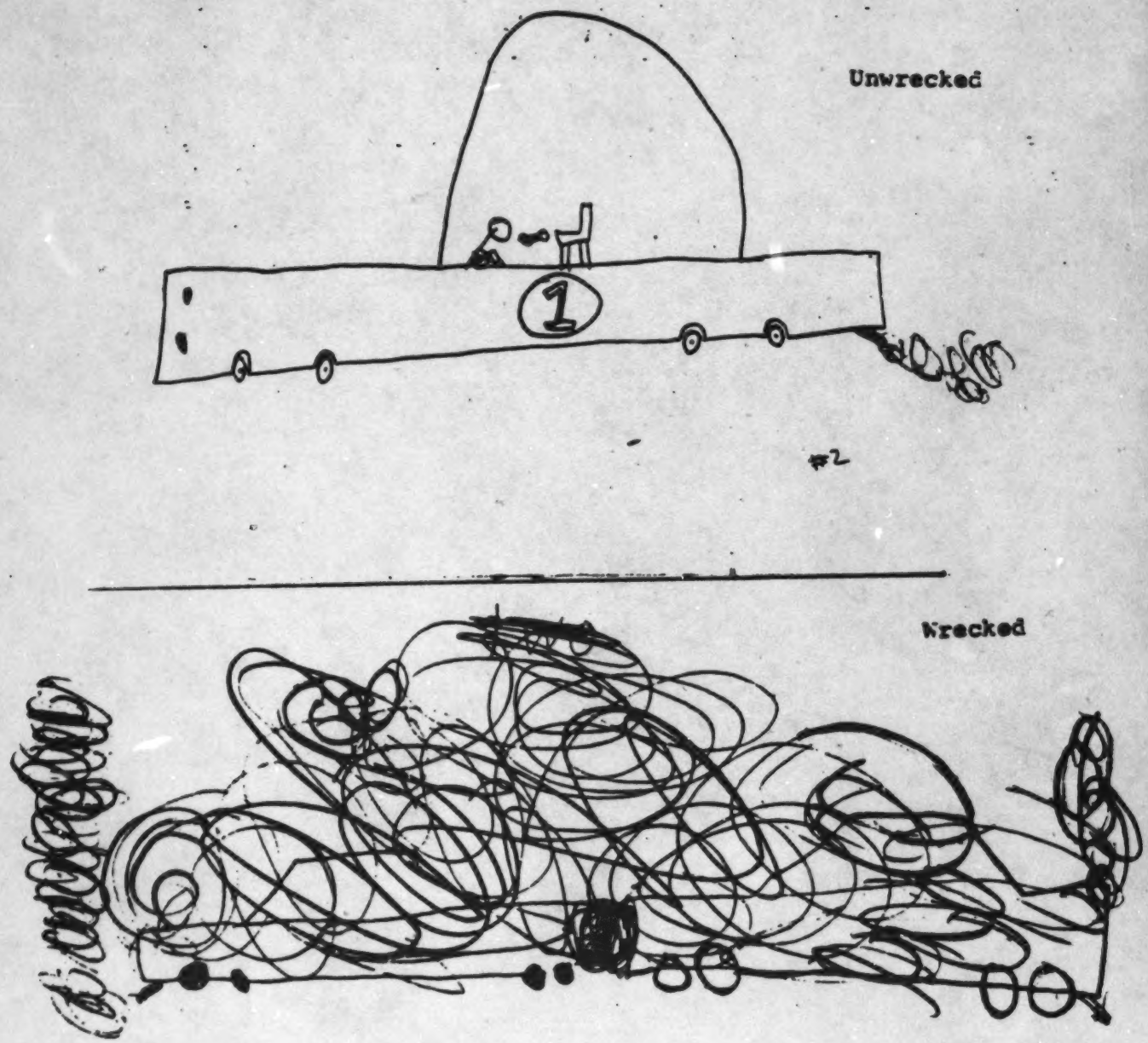
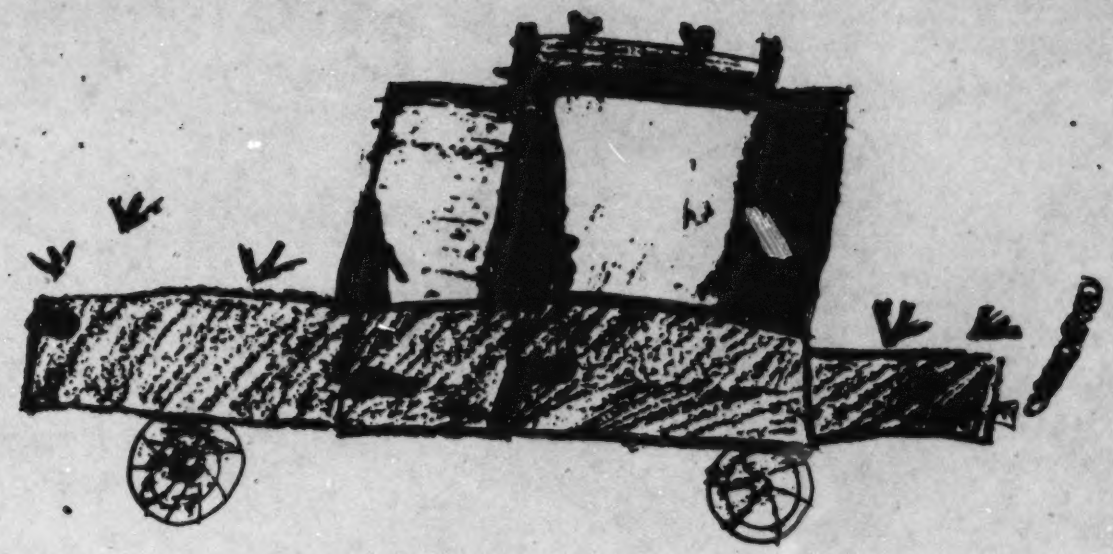


Figure 8: Drawings by Michael, age 8, showing: an unwrecked and a wrecked car.

Unwrecked



Wrecked

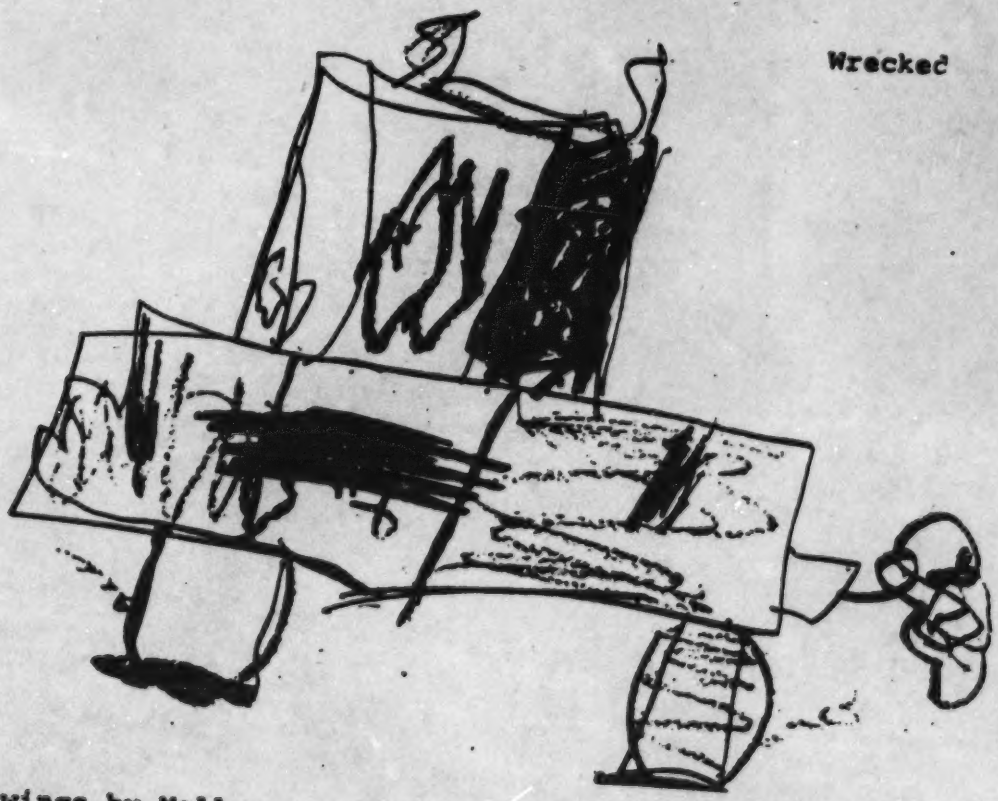


Figure 9: Drawings by Molly, age 10, showing: an unwrecked and a wrecked car.

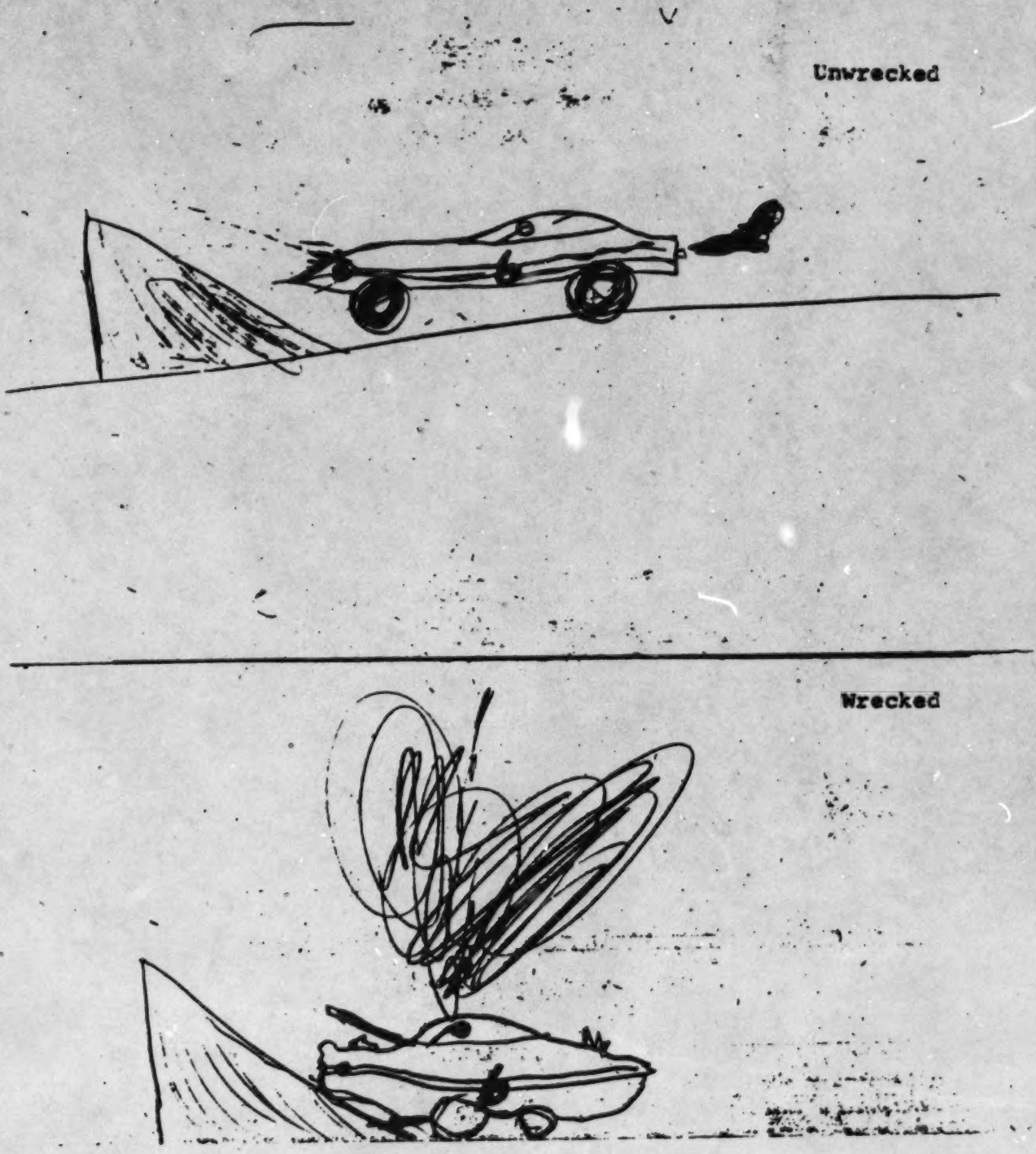
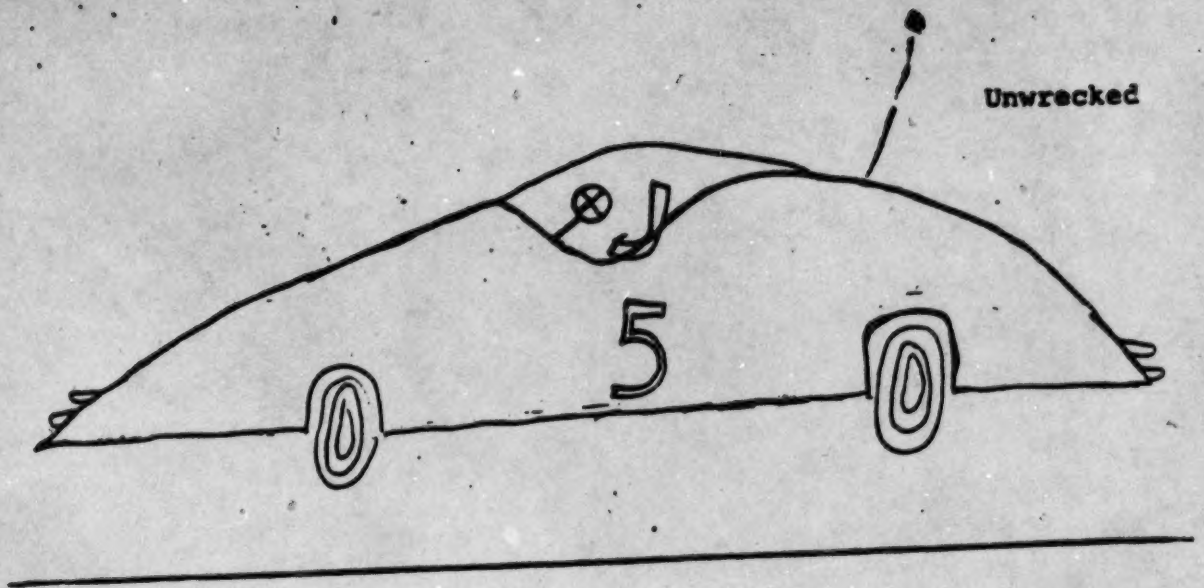


Figure 10: Drawings by A1, age 9, showing: an unwrecked and a wrecked car.



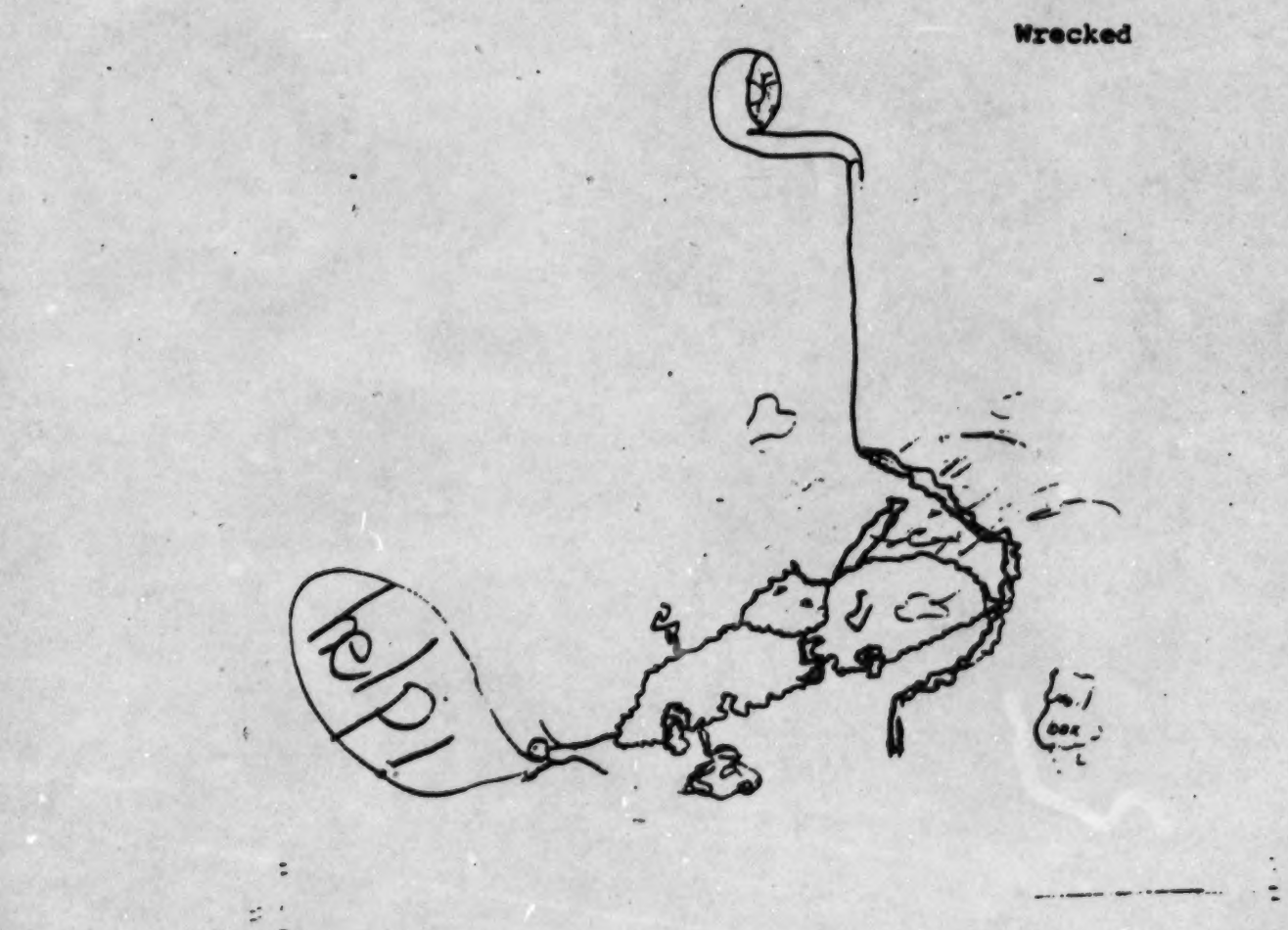
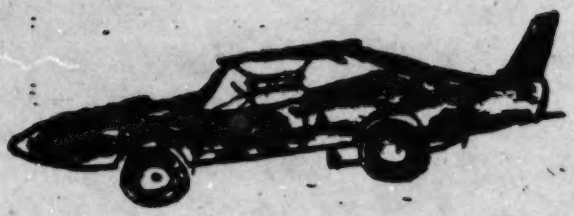


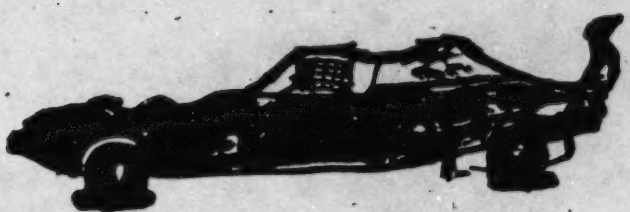
Figure 11: Drawings by Miguel, age 10, showing: an unwrecked and a wrecked car.

Unwrecked



By Mike

Wrecked



By Mike

Figure 12: Drawings by Mike, age 10, showing, an unwrecked and a wrecked car.

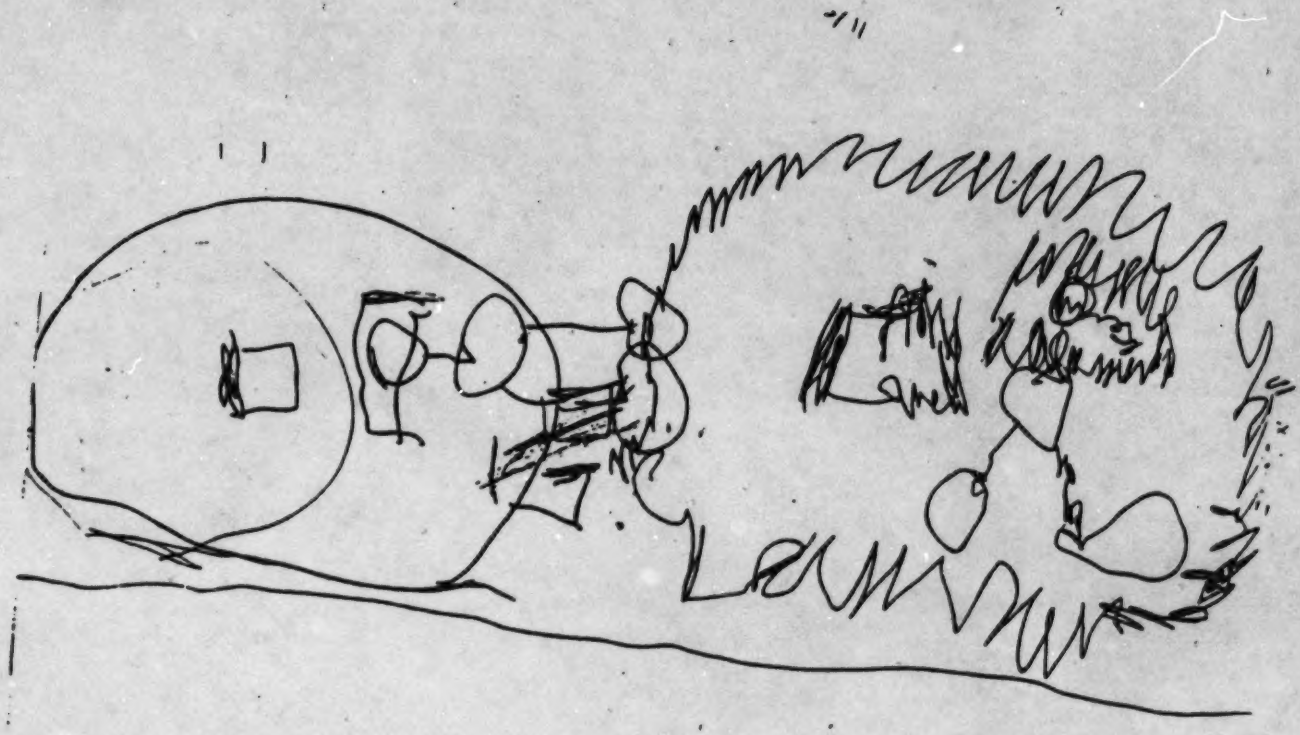


Figure 13: Drawing by Patrick, age 6, showing: a wrecked car.

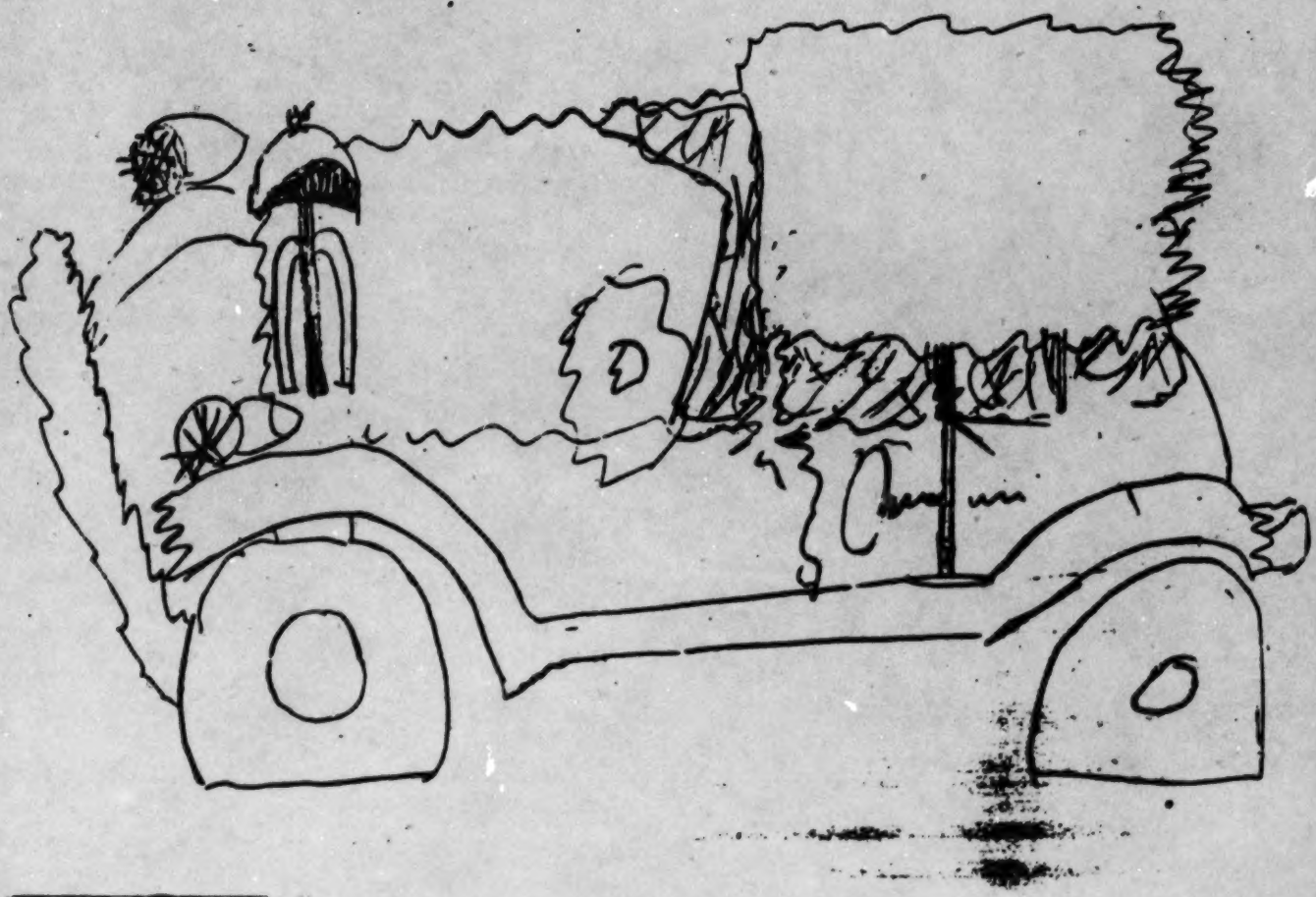


Figure 14: Drawing by Linda, age 9, showing: a wrecked car.

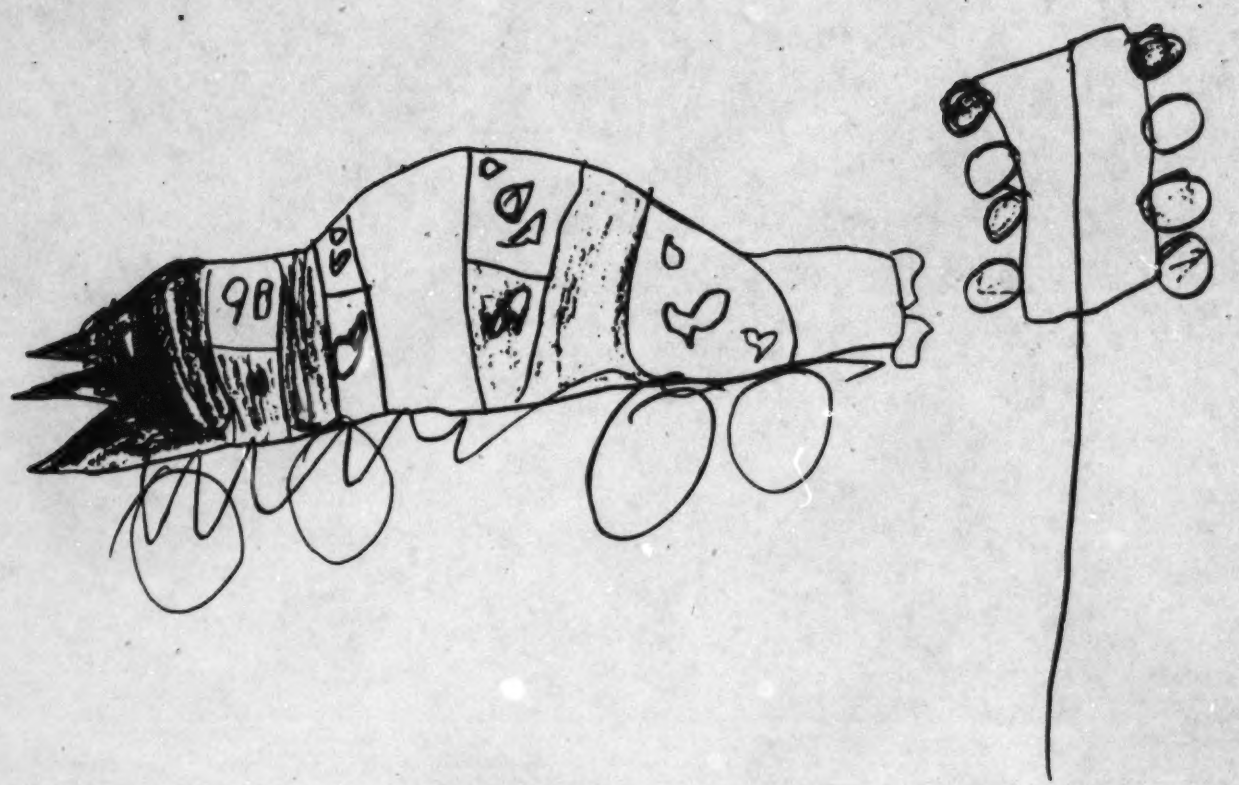


Figure 15: Drawing by Hillary age 6, showing: a wrecked car.

Harvard Project Zero is a basic research program at the Harvard Graduate School of Education. Its original charge was to study creation and comprehension in the arts and means toward better art education. A prime objective throughout the Project's history has been to provide a sound theoretical and experimental base for effective education of artists and audiences. The Project began in the fall of 1967 in response to the frank admission that, however much is known about how to educate in science and how to evaluate scientific work, practically nothing is known about the underlying principles of how to teach and evaluate in art. From that challenging "zero" the Project took its name and tasks. Our research methods include rigorous conceptual analysis, investigation of relevant literature, design and execution of key experiments in psychology and other fields, visits to arts education institutions, and application of results to proposing and assessing programs in art education.

Project founder and former director Nelson Goodman's book Languages of Art (Bobbs-Merrill, 1968) has provided important direction in our effort to isolate and investigate basic skills. This work sets forth a "theory of symbols," a broad treatment of elements of communication, embracing words, gestures, diagrams, paintings, poems, musical scores, and so on. Almost all the psychological processes under consideration in our studies of the arts involve extensive operation with and upon symbols of various kinds. These symbols are not merely instruments of communication, but also instruments of cognition, tools in terms of which the mind deals with the perceptual world.

Some of our research has examined the psychological implications of the theoretical models of symbol systems introduced in Languages of Art. For instance, one question is whether different information processing skills are necessary to produce effective art within linguistic, versus nonlinguistic, symbol systems. Another, complementary approach emphasizes problem solving and search strategies in the moment-to-moment perception and production of a work of art. How do subjects search for rhyme words in poetry or explore alternative placements of pieces in collage? A favorite means of developing and testing new models is through the study of errors. By using impoverished or ambiguous stimuli, assigning tasks somewhat too difficult for a subject, or working with brain-damaged subjects, one can elicit patterns of error-making which suggest hypotheses and select between alternative models of a process. These approaches characterize many of the Project's investigations mentioned below in a list of Project members and their particular interests.

Though the development of actual curricula in arts education is not a primary concern, the Project does contribute to the field of practical education. Project members have responded to inquiries and requests to comment on curricula from teachers in the field. Establishment of Harvard Summer School's Institute in Arts Administration resulted from the Project's reply to an inquiry from the director of the Harvard Summer School, and members of the Project staff cooperated in planning the Institute, in preparing material, and in the actual teaching. Consideration consultation has been provided to schools, museums, television, and a variety of arts institutions by members of the Project.

The Project has also sponsored a series of lecture-performances in various media, designed to give the general public and prospective public school teachers and administrators better insight into and attitudes towards artists and the arts. As the series title "Art in the Making" suggests, the purpose of the lecture-demonstrations was to reveal something of the artist's way of working, rather than to display his products. In the presence of an audience free to ask questions, each artist explored alternatives, exposed some constraints of his medium, compared his various efforts, and searched for the right effect, choice by choice.

While maintaining a major concern with the arts and art education, the Project, under its current co-directors, has considerably broadened its field of inquiry and now investigates a whole range of topics in the area of cognitive psychology. One part of the Project has focussed particularly on developmental studies. Among the topics currently being investigated are the emergence of symbolic capacities during the first years of life; the development of literary abilities, specifically the capacity to produce and appreciate metaphors and stories; children's understandings of the various worlds presented on television; the emergence of drawing skills; and the breakdown of various symbol using capacities under various forms of brain damage. The other part of the Project has concentrated on studies in the areas of cognitive and perceptual psychology, ones which utilize both normal adult subjects and gifted artists. Among the topics investigated recently have been critical judgment and the sources of critical disagreement in adults; the thought processes of professional and amateur poets and painters in developing works; the role of geometric principles in visual perception and picture perception particularly; reasoning about everyday matters and the logical difficulties people encounter.

A list of recent papers which can be purchased from the Project is available upon request.